

<p align="center">8 AUDIO PROCESSING AND ANALYSIS</p>	<p align="center">Page 1 of 2</p>
<p align="center">Division of Forensic Science</p> <p align="center">PROCEDURES MANUAL: Forensic Imaging & Audio Analysis</p>	<p align="center">Amendment Designator:</p>
	<p align="center">Effective Date: 22-March-2004</p>
<p align="center">8 AUDIO PROCESSING AND ANALYSIS</p> <p>8.1 Purpose</p> <p>Audio processing includes the application of various techniques in order to improve the intelligibility of an audio signal recorded on audio tape, video tape, or other media.</p> <p>8.2 Equipment and Material</p> <p>The following equipment and materials may be used during the analysis process</p> <ul style="list-style-type: none"> • Consumer and professional analog and digital tape recorders • Analog and digital filters • Fast Fourier Transform (FFT) analyzers • Analog and digital gain reduction devices • Professional headphones • Digital audio storage devices • Amplifiers • Cables and cable connectors • Magnetic tape developer <p>8.3 Procedures</p> <p>8.3.1 Audio evidence will be received in accordance with the Division evidence handling policy (see Section 20 in the Quality Manual).</p> <p>8.3.2 If the media has a device (mechanical or otherwise) to prevent overwriting, this device will be enabled prior to analysis. Anything removed will be retained and returned with the submitted evidence.</p> <p align="center">Example: Audio cassettes have safety tabs which can be removed to prevent further recording or overwriting.</p> <p>8.3.3 A general physical inspection of the submitted evidence will be conducted and will include, as appropriate, the cassette, reel(s), and the tape itself, to ensure there are no obvious defects.</p> <p>8.3.4 Tape markings, track development, signal analysis, or the contributor's description will be used to make a determination, if possible, as to whether the submitted media is the original recording or a duplicate. If the submitted media is a duplicate, the contributor will be contacted and the original recording will be requested. The examination of the duplicate will be terminated. If the submitted media is the original, or the only copy available, the examination will continue with ¶ 8.3.5.</p> <p>8.3.5 Make, model, and settings of the device used to produce the submitted recording will be determined, if possible. These settings may include information such as the recording format, speed, and method of recording (body microphone, telephone, etc.). If this information is not included on the RFLE, the contributor will be contacted for the necessary information. If this information is not available from the contributor, the equipment used for analysis will be chosen through visual inspection or electronic analysis using available video or audio players. Settings will be determined in order to optimize the output signal. If none of the available players can provide adequate output signals, the contributor will be requested to submit the original recording device.</p> <p align="center">Note: Any action or equipment that may damage the original recording is inappropriate and should not be used. Such actions may include, but are not limited to, maintaining the recording in the "pause" mode for extended periods, unnecessarily repeated playback of the recording, and proximity to strong magnetic fields.</p>	

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<p>8.3.6 An overall review will be conducted to determine the approximate length of the recording, tape speed, and type of information recorded in order to generally categorize the problems limiting intelligibility.</p> <p>8.3.7 An overall FFT review will be conducted, if appropriate, for analysis of speech frequency range, discrete tones, banded noise, and other significant information.</p> <p>8.3.8 At the examiner's discretion, a working copy of the pertinent segment may be generated utilizing an available digital recorder, or digitized onto an appropriate digital media.</p> <p>8.3.9 The audio may be analyzed using a number of processing operations that may include, but are not limited to, the following</p> <ul style="list-style-type: none"> • Band pass filtering • Deconvolutional filtering • Parametric equalization • Comb filtering • Compressor-limiter functions <p>8.3.10 Once analyzed, the processed audio signal is output to standard analog tapes, digital tapes, CDs, or other audio storage devices, depending upon the contributor's request and at the examiner's discretion.</p> <p>8.4 Calibration</p> <p>Calibration procedures and scheduled maintenance for all equipment will be performed in accordance with manufacturers' recommendations and recorded in the maintenance log located in the appropriate laboratory.</p> <p>8.5 Calculations</p> <p>Numerous mathematical operations, such as Fast Fourier Transforms, are involved in the digitization and analysis of audio evidence. Most of these calculations are intrinsic to the software and are considered proprietary information.</p> <p>8.6 Limitations</p> <p>It must be recognized that the greatest limitation of the analysis is the quality of the submitted recording.</p> <p>8.7 Safety</p> <p>Care should be taken to avoid circuit overload and injury when using any electrical equipment. Gloves should be worn to handle any potentially bio-hazardous evidence as well as when using chemicals.</p> <p>8.8 References</p> <p>Further instruction on specific use of audio equipment and software used in analysis can be found in the owner's manuals and user's guides for each specific piece of hardware or software.</p>	
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